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Bills of health were issued to the following-named vessels:

Date.	Vessel.	Number of crew.	Number of passengers from this port.	Number of passengers in transit.	Pieces of baggage disinfected.
June 2	Olympia	41	6	1	0
4	Helen	21	0	0	0
5	España	14	0	0	0
7	Gyller	14	0	0	0

Number of aliens sailing from this port during week, 2.

INDIA.

Report from Bombay—Shipment of goats' hair—Mortality from plague and smallpox.

Acting Asst. Surg. Edward H. Hume reports, May 21, as follows:

Under date of May 18, 1904, sanitary certificate No. 53 (consular invoice No. 140, of 1904) was granted to a shipment of 35 bales of goats' hair, sent by M. J. Joomabhoy & Co., of Bombay, and consigned to Howe & Trunkett, of Boston, Mass.

As reported in my letter of April 29, 1904, I personally inspected the method by which the goats' hair was removed from the skins by a process of soaking in a vat of lime and water, and also saw the actual shipment of hair to be sent and found it to be so saturated with lime dust as to make it seem quite reasonable that infection could not be carried by the cargo.

Mortality of Bombay City for the week ended May 17, 1904.

	Week ended May 17, 1904.	Previous week.
Plague attacks.....	258	363
Plague deaths.....	243	324
Plague mortality rate.....	16.28	21.71
Smallpox deaths.....	21	25
Cholera deaths.....	0	0
Total deaths.....	712	842
Total mortality.....	47.71	56.42

No typhus fever.

Plague a soil infection, by Capt. E. F. G. Tucker.

[Abstract of a paper read in Bombay before the Medical Society.]

Although much is known of the character and toxic products of the bacillus pestis, very little is known of it as a saprophyte in nature. Even in laboratory cultures it is polymorphic, and the question arising is whether these involution forms, so easily produced, represent forms under which the bacillus may remain latent or nonvirulent for long periods in houses, clothing, some host other than man and rodents, or the soil.

Changes of temperature can not be the essential features in determining the onset of an epidemic. For although in Bombay there is an exacerbation of the disease between January and April of each year, with a great reduction in its mortality when the hot weather comes on, nevertheless in Poona, only 120 miles away, the epidemic recurs eight or nine months after the subsidence of the previous epidemic, and at no particular season of the year.

There must, therefore, be local causes at work, more than over-

crowding, bad ventilation, etc., not yet well understood.^a People who at the height of an epidemic rush out of a city, and return again when the panic has subsided, bringing their unhealthy conditions back with them, do not cause a reappearance of the disease till the usual period of quiescence has elapsed. This leads to the "law of the recurrence of plague epidemics in India," as framed by Captain Tucker. In a population previously free from plague or free from plague in epidemic form for a period of seven to nine months (the period of quiescence) there occur at irregular intervals and scattered points deaths from acute septicæmic, pneumonic, intestinal, cerebral, or puerperal plague, which escape identification as such until the occurrence of one or two typical bubonic cases calls attention to these antecedent mysterious illnesses. This is the stage of sporadic atypical cases. After a lapse of twenty or thirty days, one to three cases of indubitable plague occur in houses contiguous, or nearly so, in one of the localities which have been infected and among people who have not yet come in contact with one another. This is the stage of local place infection.

After a period of one or two months this locality shows dropping cases of plague at the rate of one every three days or so. This is the early epidemic stage. The houses become infected in a certain order, slowly but surely—i. e., the infection runs down one side of a street in one direction only,^b or it runs through a group of houses in one direction only, sparing houses to right and left. In two or three weeks the number of cases rises with comparative suddenness to a total corresponding to the number of people in the area, the degree of congestion of the population, etc. This is the fastigial stage. The fastigium lasts for two weeks or more, and then a rapid decrease in the daily returns takes place till only one or two cases occur per diem (the stage of decline), and this gradually drops to zero. This diminution in the daily total of cases is more rapid than the rise from the early epidemic stage to the fastigium. The period of quiescence then sets in and lasts for seven to nine months, representing a state of local immunity.

The problem is to determine the position and condition of the plague bacillus during the latter part of the period of quiescence. Laboratory experiments do not exactly reproduce natural conditions. For example, in the laboratory in Bombay rats fed on pure broth cultures of plague failed to die, while those that fed on the decomposing flesh of plague cases died. Possibly this was due to the presence in the latter case of the putrefactive organisms.

Rats: In Captain Tucker's opinion rats are infected from man indirectly through the infection of house and soil. He believes that dead

^a Is it not likely that the cause of the recurrence of the epidemic will be found not so much in "local causes," as suggested by Captain Tucker, as in the life history of the bacillus? In support of this idea, attention may be called to the fact that the cases early in an epidemic seem regularly to present a different clinical picture from that observed later on in the same locality. Repeated observations show that whereas, early in the epidemic, cases are acute, die early, or if they live beyond the fourth day, are apt to recover. On the other hand, late in the epidemic, cases drag on, often from ten to fourteen days, and then die. Clinically, at least, this points to a change in the virulence or other characteristic of the life of the bacillus.

^b Although, as I have shown in my letter of March 5, 1904, plague does take a general direction in a city like Bombay and become virulent in one ward after it has passed its climax in another, still in my observations during February, March, and April of this year I have seen no such regularity in a given street. Cases crop up without any order or regularity in most unexpected places. This will appear more fully in the report of my own observations.

rats are only found at the stage of local place infection, and says, "The theory that an epizootic in rodents is the cause of an epidemic among human beings is a pernicious theory, not so much because it is only half true, but because the modern tendency to put rat destruction in the forefront of preventive measures diverts the attention of the authorities from more important details."^a

Fleas: In opposition to the theory of transmission by fleas, Captain Tucker says that the rat flea (*pulex pallidas*) has not been found on man, and that if fleas could transmit plague it would be a contagious disease. This has been disproved.^b

Captain Tucker's theory, then, is that, as in China, the soil in India is saturated with human and animal excreta, the subsoil poorly drained, and a congested population lives in close contact with the soil, their standard of health being lowered by insufficient or innutritious food, and their dwellings having poor light and ventilation. In this way the plague bacillus gains access from the soil to man.

After giving several illustrations from his wide experience in Poona, which seemed to prove that there was soil infection, Captain Tucker speaks of house infection as follows: "People can return to their shops in evacuated areas for the purpose of carrying on their trade by day with impunity, so long as they leave them for the health camp before the sun sets; and the explanation of this curious fact * * * appears to me to be that when there are several persons asleep in a crowded room with every window and door shut the temperature inside the house rises considerably, with the result that the contained air thus rendered lighter ascends, and hence the relatively heavy cold air external to the house tends to produce a liberation of the ground air into the hot room. This ascent of the ground air would be certainly accompanied by an ascent of minute particulate matter present in the contaminated soil."

In view of the abundance of bacterial flora present in the soil of a native dwelling, disinfection of a plague-infected house of the poorer class seems useless.

Reports from Calcutta—Inspection of vessel—Cholera and plague mortality.

Passed Assistant Surgeon Sprague reports, May 26, as follows:

During the week ended May 21, 1904, bill of health was issued to steamship *Bantu*, bound for Boston and New York, with a total crew of 59. The usual precautions were taken. Effects of 48 Lascars were

^a Neither the experience gained during the second epidemic in Sydney in 1902 (Report: paragraphs 229, 231), nor the experience of workers generally in India, nor my own observations lead me to agree with the theory that rats do not play the most important rôle in bringing plague to a previously uninfected locality. Time after time I have seen plague break out in a previously healthy chawl, on floors some feet above the ground, and trace the disease to the presence of dead rats in the immediate vicinity.

^b The observers in Sydney believe (Report: para 300) that fleas play a very important part in transmitting plague from rats to man. My observations on this point are necessarily limited; and the universal prevalence of fleas in the Indian household makes it hard to determine whether a given crop of fleas came from infected rats. However, in the case of the daughter and wife of the U. S. consul at Bombay, as shown in my letters of March 26 and April 2, 1904, there seems little doubt that fleas were concerned in transmitting plague from an infected rat to human beings. In spite of the criticisms offered, Captain Tucker's observations must be given much weight, because of his wide experience. Only by special study of the points debated can definite conclusions be reached.